National Institute of Environmental Health Sciences

The relationship of respiratory and cardiovascular hospital admissions to the southern California wildfires of 2003

Author(s): Delfino RJ, Brummel S, Wu J, Stern H, Ostro B, Lipsett M, Winer A, Street DH, Zhang L, Tjoa T, Gillen DL

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Abstract:

OBJECTIVE: There is limited information on the public health impact of wildfires. The relationship of cardiorespiratory hospital admissions (n Euro Surveillance (Bulletin Europeen Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) 40 856) to wildfire-related particulate matter (PM(2.5)) during catastrophic wildfires in southern California in October 2003 was evaluated. METHODS: Zip code level PM(2.5) concentrations were estimated using spatial interpolations from measured PM(2.5), light extinction, meteorological conditions, and smoke information from MODIS satellite images at 250 m resolution. Generalised estimating equations for Poisson data were used to assess the relationship between daily admissions and PM(2.5), adjusted for weather, fungal spores (associated with asthma), weekend, zip code-level population and sociodemographics. RESULTS: Associations of 2-day average PM(2.5) with respiratory admissions were stronger during than before or after the fires. Average increases of 70 microg/m(3) PM(2.5) during heavy smoke conditions compared with PM(2.5) in the pre-wildfire period were associated with 34% increases in asthma admissions. The strongest wildfire-related PM(2.5) associations were for people ages 65-99 years (10.1% increase per 10 microg/m(3) PM(2.5), 95% CI 3.0% to 17.8%) and ages 0-4 years (8.3%, 95% CI 2.2% to 14.9%) followed by ages 20-64 years (4.1%, 95% CI -0.5% to 9.0%). There were no PM(2.5)-asthma associations in children ages 5-18 years, although their admission rates significantly increased after the fires. Per 10 microg/m(3) wildfire-related PM(2.5), acute bronchitis admissions across all ages increased by 9.6% (95% CI 1.8% to 17.9%), chronic obstructive pulmonary disease admissions for ages 20-64 years by 6.9% (95% CI 0.9% to 13.1%), and pneumonia admissions for ages 5-18 years by 6.4% (95% CI -1.0% to 14.2%). Acute bronchitis and pneumonia admissions also increased after the fires. There was limited evidence of a small impact of wildfire-related PM(2.5) on cardiovascular admissions. CONCLUSIONS: Wildfire-related PM(2.5) led to increased respiratory hospital admissions, especially asthma, suggesting that better preventive measures are required to reduce morbidity among vulnerable populations.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution, Extreme Weather Event

Air Pollution: Particulate Matter

Extreme Weather Event: Wildfires

Geographic Feature: ☑

resource focuses on specific type of geography

Desert

Geographic Location: ☑

resource focuses on specific location

United States

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Cardiovascular Effect, Respiratory Effect

Cardiovascular Effect: Heart Attack, Stroke, Other Cardiovascular Effect

Cardiovascular Disease (other): cardiovascular hospital admissions

Respiratory Effect: Asthma, Bronchitis/Pneumonia, Chronic Obstructive Pulmonary Disease, Other Respiratory Effect

Respiratory Condition (other) : respiratory hospital admissions

Population of Concern: A focus of content

Population of Concern: ☑

populations at particular risk or vulnerability to climate change impacts

Children, Elderly

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Time Scale Unspecified